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(54) Offset perfecting printing

(57) Several printing units (1 to 4) each having two blanket cylinders (5, 6; 10, 11) between which the web is conveyed for first and second printing, are arranged one behind the other in the running direction of the web (7).

In order to avoid doubling of the printed image caused by web oscillation, the web is guided in such a way that it runs into a printing unit with partial wrapping around one of the blanket cylinders and runs out of this printing unit at approximately right angles to a plane containing the axes of the blanket cylinders. To achieve this the planes (A and B) containing the axes of the respective blanket cylinders (5, 6, 10, 11) are inclined to each other at an included angle (α) and the cylinders of the adjacent units are staggered relative to each other in the vertical direction.

In other embodiments the partial wrap around on the entry side of a printing unit and the exiting perpendicular to the plane containing the axes of the blanket cylinders is achieved by means of a web deflecting element, which may be adjustable, between the printing units.

Fig.1

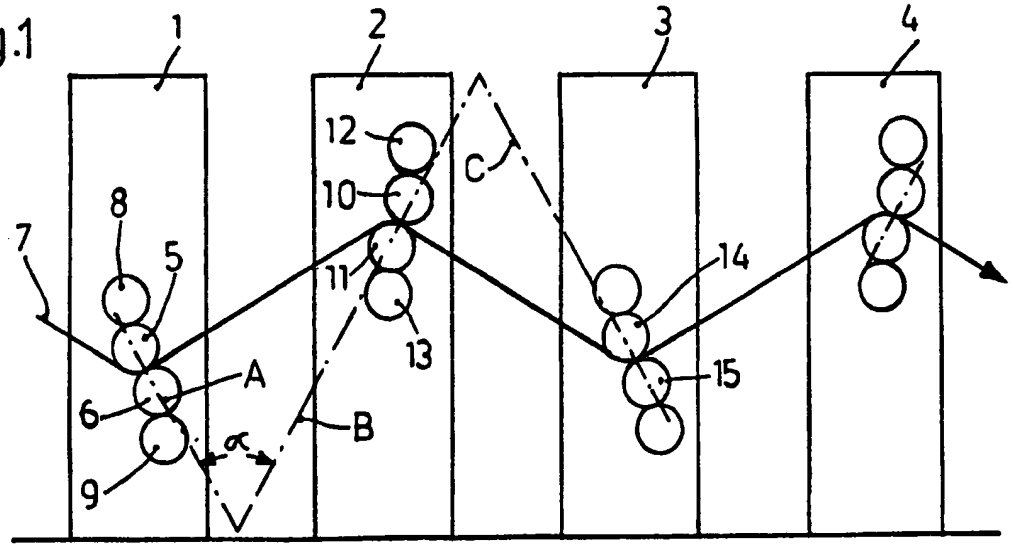

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Fig.1

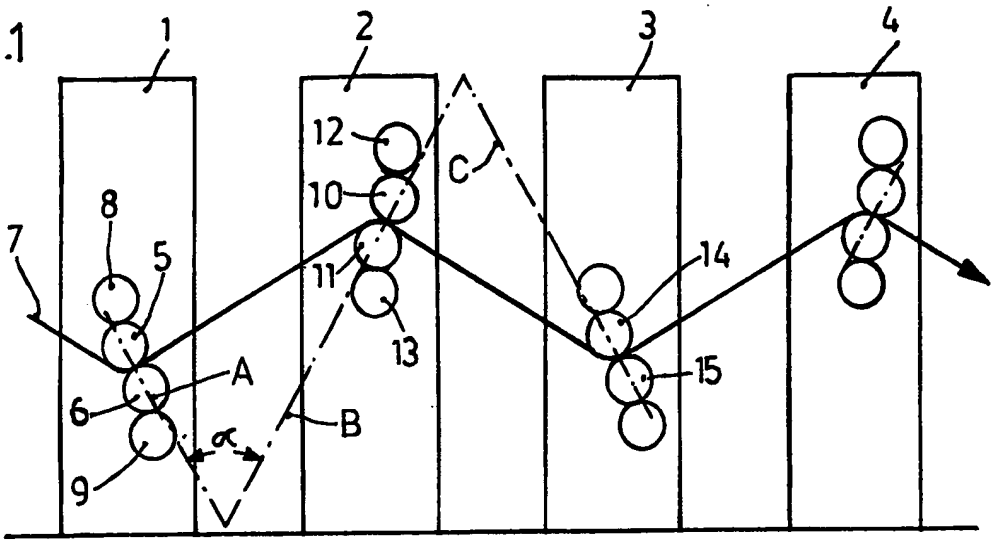


Fig.2

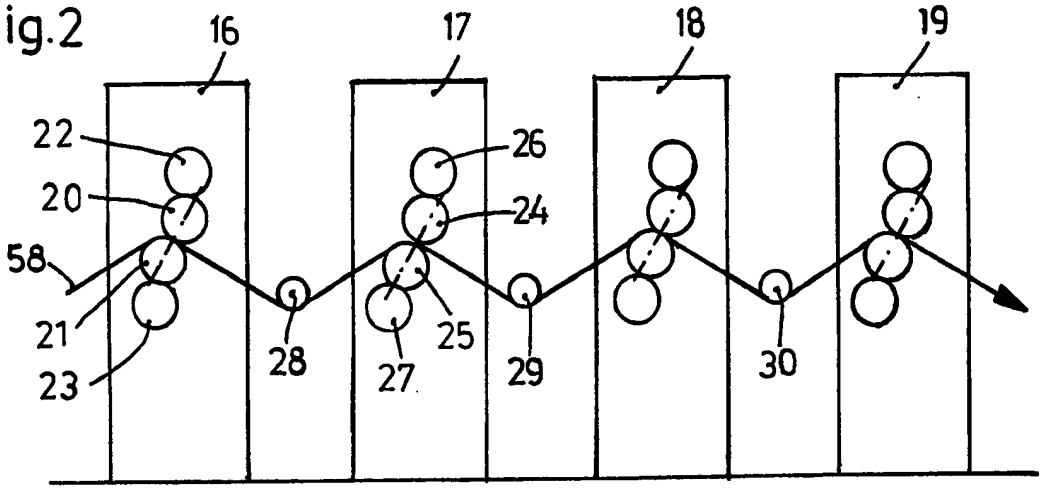


Fig.3

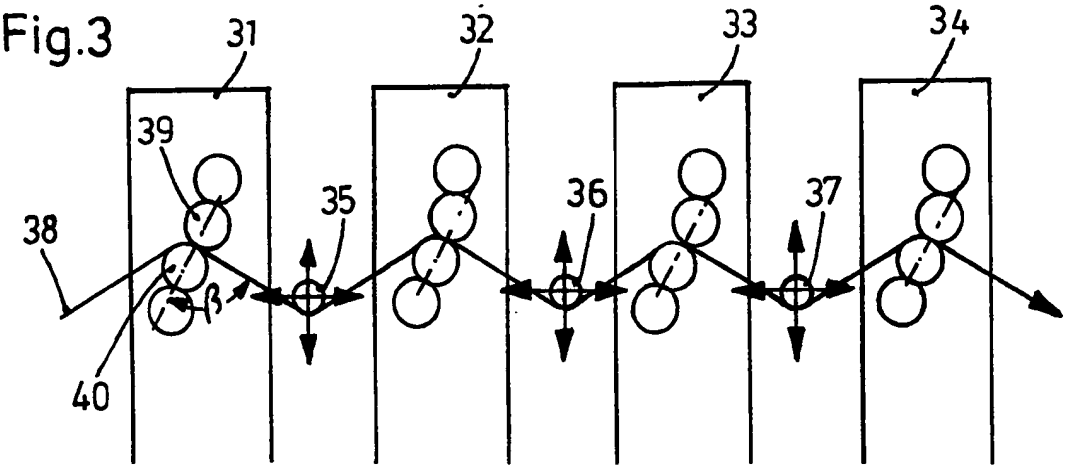


Fig.4

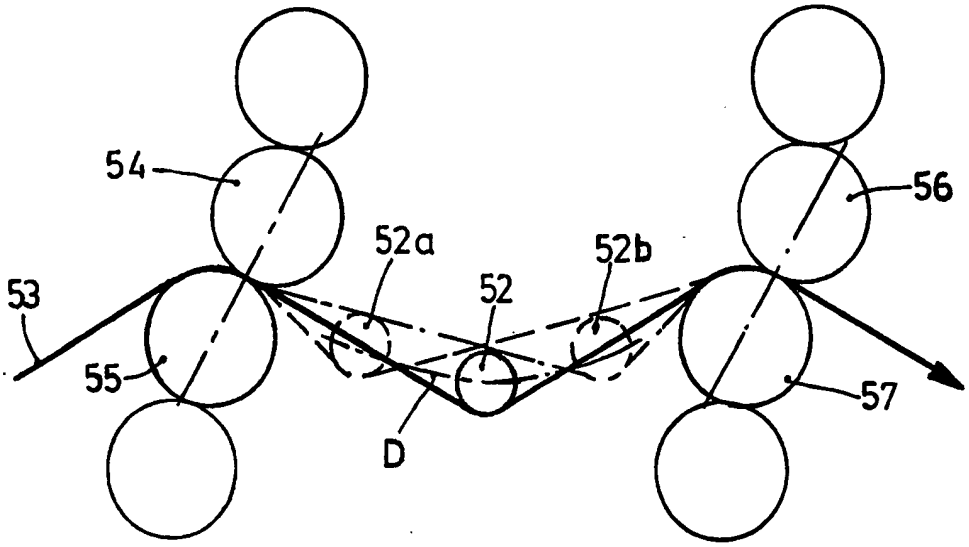
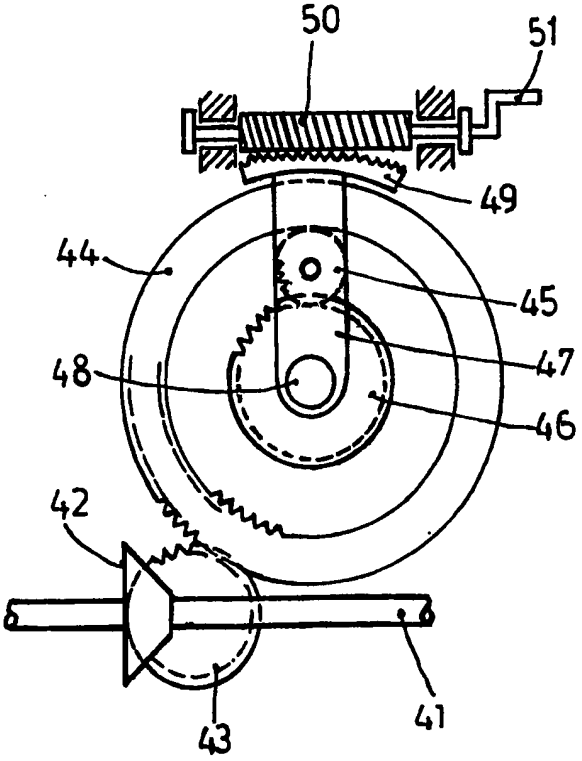


Fig.5



SPECIFICATION

Web offset-rotary printing press

This invention relates to a web offset-rotary printing press with at least two printing units for first and second printing arranged one behind the other in the running direction of the printing carrier web, each having two blanket cylinders for first and second printing between which the printing carrier web is conveyed.

German Patent Application P 31 52 017.0 is based on the knowledge that with printing presses of this type, in particular with fairly large plate cylinders on which several plates can be secured, doubling of the print image can be caused by the fact that the printing carrier web remains stuck for a short time to one of the blanket cylinders and then separates. Thus the printing carrier web is drawn out of the theoretical running plane of the web and when separated starts to oscillate. A printing carrier web oscillating in this way does not then run cleanly between the blanket cylinders of the next printing unit, but strikes against one of the two blanket cylinders before the printing line and thus causes the appearance of doubling.

To remove this drawback it was suggested in the earlier patent specification to guide the printing carrier web between two printing units through a gap limited by fixed walls, and to provide air cushions between the printing carrier web and the gap walls. These measures were therefore directed to reducing the oscillations of the web which occur during run-out from one printing unit before the run-in to the next printing unit.

The aim of the present invention is so to construct a web offset-rotary printing press of the type mentioned at the beginning that the occurrence of oscillations in the printing carrier web, which may lead to doubling, is substantially avoided when it leaves a printing unit.

According to the present invention there is provided a web offset-rotary printing press with at least two printing units arranged one behind the other in the running direction of the printing carrier web, each having two blanket cylinders for first and second printing between which blanket cylinders the printing carrier web is conveyed, wherein the printing carrier web is guided such that it runs into a printing unit with partial wrapping around one of the blanket cylinders of that unit and runs out in a direction approximately at right angles to a plane containing the axes of the two blanket cylinders of that unit.

The invention may be put into practice in a number of ways but certain specific embodiments will now be described by way of example with reference to the accompanying drawings, in which:—

Figure 1 is a schematic side view representation of the essential parts of a web offset-rotary printing press constructed in accordance with the invention;

Figure 2 shows a second embodiment in a reproduction corresponding to Figure 1;

Figure 3 shows a third embodiment also in a reproduction corresponding to Figure 1·

Figure 4 shows a detail of a fourth embodiment in a schematic side view; and

Figure 5 shows a device for rotating the blanket cylinders that can be used in the arrangement according to Figure 3.

The web offset-rotary printing press shown in Figure 1 comprises four printing units 1, 2, 3, 4. The printing units 1 and 3, on the one hand, and 2 and 4, on the other hand, are of the same construction as each other. The printing unit 1 has two blanket cylinders 5, 6, between which the printing carrier web 7 is guided. Each of the two blanket cylinders 5, 6 co-operates with a plate cylinder 8, 9, respectively on which, in a manner known per se, and not shown, an inking unit and a dampening unit can be placed. Similarly the printing unit 2 is provided with two blanket cylinders 10, 11 and two plate cylinders 12, 13.

The blanket cylinders 5, 6; 10, 11 of the printing units 1, 2 are arranged with respect to one another in such a way that the printing carrier web 7 leaves the blanket cylinders 5, 6 at right angles to a plane A containing the axes of these cylinders and shown in dot-dash line, and runs into the blanket cylinders 10, 11 of the printing unit 2 with partial wrapping around the blanket cylinder 11. From the printing unit 2 of the printing carrier web 7 similarly runs out at right angles to a plane B containing the axes of the two blanket cylinders 10, 11 in order to run into the printing unit 3 with partial wrapping around the one blanket cylinder 14 of the next printing unit 3.

With the printing press of Figure 1 this guiding of the printing carrier web 7 is achieved by the two planes A and B being arranged to be inclined to one another. It is advisable so to select this inclination that the two planes A and B enclose an angle α of approximately 60°. In a similar way the plane B also encloses with a plane C containing the axes of the blanket cylinders 14, 15 of the printing unit 3 an angle of approximately 60°. Thus the cylinders of the printing units 1 and 3 are arranged to be staggered in the vertical direction with respect to the cylinder of the printing units 2 and 4.

The web guiding that is described means on the one hand that the printing carrier web 7 wraps sufficiently around a blanket cylinder in each printing unit that even when passing through the groove the printing carrier web can not become free. On the other hand it means also that the printing carrier web is released at the same time both from the upper blanket cylinder, e.g. 5, and from the lower blanket cylinder, e.g. 6, since the web 7 is drawn off in a direction at right angles to the plane, e.g. plane A, containing the axes of those blanket cylinders. The forces for removing the web from the two blanket cylinders of a printing unit are therefore substantially balanced and thus prevent the paper web from following the one or the other blanket cylinder for longer time. A web guidance error angle can therefore not occur or will occur only to a small degree such that

resonance (oscillation) of the printing carrier web can not take place.

With the embodiment in Figure 2, conventional printing units 16, 17, 18, 19 are used which are constructed to be the same as one another and the cylinders of which lie on the same level. The printing unit 16 has two blanket cylinders 20, 21 and two plate cylinders 22, 23. Similarly, the printing unit 17 has two blanket cylinders 24, 25 and two plate cylinders 26, 27. The planes containing the axes of the blanket cylinders of each printing unit lie parallel to one another with this configuration. Likewise, the printing units 18 and 19 have corresponding blanket and plate cylinders, and the planes containing the axes of the blanket cylinders are parallel to the corresponding planes of units 16 and 17.

In order to guide the printing carrier web 58 with a printing press of this type so that it runs into the printing unit 17 with partial wrapping around, for example, the blanket cylinder 25, and leaves this at right angles to the plane containing the axes of the blanket cylinders 24, 25, between the individual printing units there are provided web-deflecting elements 28, 29 and 30. As web-deflecting elements there can be used non-smearing rollers, for example beam rollers, or rollers with air circulating around them, or fixed elements constructed like turning bars preferably with air circulating around them.

With the printing press according to Figure 3 there are provided between each adjacent pair of the printing units 31 to 34 web-deflecting elements 35, 36 and 37 which, as indicated by arrows, are arranged adjustably in two mutually perpendicular directions approximately at right angles (i.e. vertically) to the printing carrier web 38 and generally longitudinally thereof (i.e. horizontally). Otherwise the construction of the printing press of Figure 3 coincides completely with that of Figure 2.

This construction not only offers the advantage of a simple adjustment of the web-deflecting elements 35 to 37 but also, when for example an upper blanket cylinder, e.g. 39, carries a heavier forme than the lower blanket cylinder, e.g. 40, and therefore is covered with ink on substantially larger surfaces, an additional adjustment may be carried out in such a way that the angle β, which the printing carrier web encloses with the plane containing the axes of the blanket cylinders 39, 40, is adjusted to be somewhat smaller than 90°. To this end the web-deflecting element 35 is moved from the theoretically desired position somewhat downwards. If the lower blanket cylinder 40 is to be coated with ink on larger surfaces that the upper blanket cylinder 39 then the web-deflecting element 35 is to be adjusted from its theoretically desired position somewhat upwards. The horizontal adjustment possibility of the elements 35, 36, 37 is used so that the web is again guided as soon as possible after leaving the cylinders, in order in this way also to counteract the tendency to oscillation, and also by appropriate adaptation to be able to avoid possible occurrences of resonances.

When using the adjustable web-deflecting elements 35 to 37, the length of the run of printing carrier web 38 between the two printing lines of two adjacent printing units, e.g. 31, 32 can change. In order to compensate for a change in length of this kind, it is advisable for there to be associated with the printing units 32 to 34 following the first printing unit 31 a device for the reciprocal counter-directional rotation of both the blanket- and plate cylinders.

A device of this type can be constructed as shown in Figure 5. With this arrangement there is placed on a main drive shaft 41 of the printing press, from which the drives for the individual printing units are derived a bevel wheel 42 which mates with a further bevel wheel 43. The bevel wheel 43 is additionally provided with an external gearing which engages in an external gearing of a wheel 44. The wheel 44 also has an internal gearing into which a pinion 45 engages which is in engagement at the same time with a gear wheel 46. The pinion 45 is mounted on a rocker arm 47 which can be rotated round a shaft 48. The shaft 48 is firmly connected to one of the two blanket cylinders of a printing unit and the gear wheel 46. The rocker arm 47 carries in addition a segment of a worm wheel 49 which co-operates with a worm gear 50. The worm gear 50 can be rotated but is mounted securely against axial shifting and firmly connected to a crank handle 51.

By rotating the worm gear 50, the rocker arm 47 is swivelled over the worm wheel segment 49 round the shaft 48. The pinion 45 mounted on the rocker arm follows this movement. Since, the press is stationary, the main drive shaft 41 stands still and hence also retains the wheel 44 via the bevel wheels 42, 43, the pinion 45 goes to the internal gearing of the wheel 44 and thus turns the gear wheel 46. Since the gear wheel 46 together with the respective blanket cylinder is firmly located on the shaft 48, the blanket cylinder also follows this movement. The second blanket cylinder of the printing unit is in known manner carried along in the opposite direction through a gear wheel connection between the two blanket cylinders. With this device, therefore, lengthening or shortening of the run of printing carrier web 38 between two printing lines can be compensated in two adjacent printing units.

In order to avoid the need for an adjustment device according to Figure 5 for the printing units arranged downstream of the first printing unit, there is alternatively the possibility, as shown in Figure 4, of using web-deflecting elements 52 which can be adjusted approximately in the running direction of a printing carrier web 53 between blanket cylinders 54, 55 of a first printing unit and blanket cylinders 56, 57 of a second printing unit along a curved path or locus D indicated in dot-dash line. The curved path or locus D is thus so constructed that irrespectively of the adjustment of the web-deflecting element 52, whose possible end positions are indicated by 52*a* and 52*b*, for altering the web angle to the

plane containing the axes of the blanket cylinders, the length of the printing carrier web 53 between the two printing lines of the blanket cylinders 54, 55 on the one hand and 56, 57 on the other hand always remains constant. The two end positions are again provided for the case where one of the two blanket cylinders 54 or 55 is coated with ink on surfaces that are substantially larger than the other blanket cylinder.

CLAIMS

1. A web offset-rotary printing press with at least two printing units arranged one behind the other in the running direction of the printing carrier web, each having two blanket cylinders for first and second printing between which blanket cylinders the printing carrier web is conveyed, wherein the printing carrier web is guided such that it runs into a printing unit with partial wrapping around one of the blanket cylinders of that unit and runs out in a direction approximately at right angles to a plane containing the axes of the two blanket cylinders of that unit.

2. A printing press as claimed in claim 1, in which the planes containing the axes of the respective blanket cylinders of two adjacent printing units are arranged to be inclined to one another.

3. A printing press as claimed in claim 2, in which the cylinders of the two adjacent printing units are respectively arranged to be staggered in height (i.e. relative to the general longitudinal direction of movement of the web) with respect to one another.

4. A printing press as claimed in claim 2 or claim 3, in which the planes enclose an angle of about 60°.

5. A printing press as claimed in claim 1, in which the planes containing the axes of the respective blanket cylinders of two or more adjacent printing units lie parallel to each other, and between the two or each pair of printing units there is provided a web-deflecting element.

6. A printing press as claimed in claim 5, in which the or each web-deflecting element is arranged adjustably in two mutually perpendicular directions approximately at right angles to the printing carrier web and generally longitudinally thereof, and associated with the two blanket cylinders of the or each printing unit following the first printing unit is a device for the reciprocal counter-directional rotation of these blanket cylinders with the associated plate cylinders.

7. A printing press as claimed in claim 5, in which the or each web-deflecting element can be adjusted approximately in the running direction of the printing carrier web along a locus such that the length of the run of printing carrier web between the printing lines of the two adjacent printing units does not change.

8. A printing press as claimed in claim 6 or claim 7, in which the adjustment path of the web-deflecting element is selected to be such that for compensation of varying ink coating of two co-operating blanket cylinders, the run-out direction of the printing carrier web from these blanket cylinders can be adjusted to deviate at either side from the perpendicular to the plane containing the axes of the blanket cylinders.

9. A printing press as claimed in any one of claims 5 to 8, in which as a web-deflecting element there is used a non-smearing roller, for example a beam roller, or a roller with air circulating round it, or a fixed element constructed as a turning bar preferably with air circulating round it.

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